**Kennedy/Jenks Consultants**

10850 Gold Center Drive, Suite 350
Rancho Cordova, CA 95670-6034
(916) 858-2700
(916) 858-2754 (fax)

# City of Woodland
# Urban Water Management Plan
# 2005

21 December 2005


Prepared for

**City of Woodland**
Public Works Department, Engineering Division
655 N. Pioneer Avenue
Woodland, CA 95695

K/J Project No. 0570021*00

# Table of Contents

## List of Tables



## List of Figures

## Table of Contents (cont'd)

## List of Appendices

# City of Woodland
# 2005 Urban Water Management Plan
# Contact Sheet

Date plan submitted to the Department of Water Resources: **12/31/05**

Name of person preparing this plan: **Cathy Lee, Associate Civil Engineer**
**Infrastructure Engineering/Utilities Branch**

Phone: **(530) 661-5885**

Fax: **(530) 661-1290**

E-mail address: **cathy.lee@cityofwoodland.org**

The Water supplier is a: **Municipal Water Supplier**

The Water supplier is a: **Retailer**

Utility services provided by the water supplier include: **Water**

Is This Agency a Bureau of Reclamation Contractor? **No**

Is This Agency a State Water Project Contractor? **No**

# Section 1: Public Participation

## 1.1 Public Participation

> 10642. Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published. After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

The City of Woodland (City or Woodland) has actively encouraged community participation in its urban water management planning efforts since the first plan was developed in 1985. For this 2005 update to the Urban Water Management Plan (UWMP), the City published a press release in the local newspaper and posted the draft plan on its web page to solicit comments from interested parties on the draft plan.

A special effort was made to include the grassroots community. The press release was sent to organizations listed below. Copies of the draft plan were available on the City's web page. Interested parties were also invited to attend the public hearing at the City's December 6, 2005 City Council meeting. A copy of the press release and public meeting notice is in Appendix A.

### 1.1.1 Plan Adoption

This plan includes all information necessary to meet the requirements of California Water Code Division 6, Part 2.6 (Urban Water Management Planning). The City prepared this update of its UWMP during the fall of the year 2005. The updated UWMP was adopted by the City Council on December 6, 2005 and submitted to the California Department of Water Resources. Copies of the signed Resolution of Plan Adoption were attached to the cover letter that was addressed to the Department of Water Resources. A copy of the signed resolution is included in Appendix B.

## 1.2 Agency Coordination

> 10620 (d) (2) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.
>
> 10620 (f) An urban water supplier shall describe in the plan water management tools and options by that entity that will maximize resources and minimize the need to import water from other regions.

### 1.2.1 Coordination within the City

The City Public Works Department staff met and coordinated the development of this UWMP update with the City Council and City departments. Information from the City's 2005 Draft Surface Water Feasibility and 2002 General Plan was used to prepare this UWMP update.

### 1.2.2 Interagency Coordination

The City is a member agency of the Water Resources Association (WRA) of Yolo County. Groundwater for the City is obtained from a common groundwater basin that is utilized by local agricultural operations. The City solicited input for this UWMP update from the following agencies and organizations:

- Yolo County Flood Control and Water Conservation District,
- Reclamation District (RD) 2035,
- Farm Bureau,
- Woodland Chamber of Commerce, Water Task Force, and
- WRA

Table 1 summarizes the efforts the City took to include various agencies and citizens in its planning process. A list of groups who participated in the development of this Plan is included in Appendix C.

**Table 1: Coordination and Public Involvement**

| | Coordination and Public Involvement Actions | | | | |
|---|---|---|---|---|---|
| **Entities** | **Was contacted for assistance** | **Was sent a copy of the draft** | **Commented on the draft** | **Attended public meetings** | **Was sent a notice of intention to adopt** |
| Wastewater | ✓ | ✓ | | | ✓ |
| Special Interest Groups | | ✓ | | | |
| Citizen Groups | | | | | |
| General Public | | | ✓ | | ✓ |
| Public Library | | | | | |
| Other | | | | | |

### 1.2.3 Maximize Resources and Minimize Imported Water

Currently, the City does not import water from other resources. To maximize the City's limited resources, the City ensures that the water sources and distribution systems are properly maintained to prevent catastrophic failures and water shortages. The City is planning and seeking automation in operations such as controls, computerized work orders, and assessment management tools to assist staff.

## 1.3 Supplier Service Area

The City is located in the Sacramento Valley, approximately six miles west of the Sacramento River and about 20 miles northwest of California's capital. Incorporation of the City occurred in 1871. The City's municipal water supply is based solely on groundwater well pumpage. In 2005, the City's water service area is approximately 10 square miles. Water service is provided to residential, commercial and industrial customers, and for fire protection uses. There are also private groundwater wells within the City. Figure 1 provides a location map of the service area.

### 1.3.1 Climate

Woodland has a Mediterranean climate. Summers are mild to hot, and dry, and winters are cool and rainy, with an annual average of approximately 19 inches of precipitation. The local annual average of maximum daily temperature is 75 degrees (F). The region is subject to wide variations in annual precipitation. Average rainfall over the last six seasons was 23.8 inches. 1997-98 was a relatively wet year (31.7 inches of rainfall). Rainfall total from fall 1999 to May 2000 was 19.5 inches. Table 2 presents climatic data for the Woodland area.

**Table 2: Woodland 1 WNW, California (049781)**

**Monthly Climate Summary Period of Record: 7/1/1948 to 3/31/2005[(a)]**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Max. Temperature (F) | 53.6 | 60.3 | 66.1 | 73.5 | 82.0 | 90.4 | 95.7 | 94.2 | 90.1 | 79.4 | 64.5 | 54.3 | 75.3 |
| Average Min. Temperature (F) | 37.6 | 41.0 | 43.5 | 46.4 | 51.6 | 56.3 | 58.0 | 57.1 | 55.4 | 50.0 | 42.9 | 37.7 | 48.1 |
| Average Total Precipitation (in.) | 4.06 | 3.63 | 2.63 | 1.25 | 0.46 | 0.14 | 0.02 | 0.07 | 0.32 | 1.00 | 2.45 | 3.30 | 19.34 |
| Average Evapotranspiration (in) | 1.04 | 1.76 | 3.17 | 4.72 | 6.10 | 7.68 | 8.18 | 7.20 | 5.43 | 3.66 | 1.65 | 1.04 | 51.63 |
| Average Total Snow Fall (in.) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| Average Snow Depth (in.) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

(a) Source: Western Regional Climate Center

### 1.3.2 Land Use

The General Plan Area for the Woodland General Plan covers approximately 56,000 acres and is bounded on the north by Cache Creek, on the east by Yolo Bypass, on the south by County Road 27 and on the west by County Road 93. This area includes the City of Woodland's Planning Area and two unincorporated communities of Willow Oak and Monument Hills. The remaining area is designated for agricultural uses.

The Planning Area encompasses about 12,000 acres and includes all land designated for or to be considered for future development as part of Woodland, including land within the Urban Limit Line, an area of urban reserve on the east, the City's wastewater treatment plant, and the regional park site

### 1.3.3 Population Growth and Other Demographic Factors

The rate of population growth is limited in the General Plan to 1.8% per year (Woodland, 1996). However, the U.S. Census for 2000 and the California Department of Finance DOF Table 2: E-5) found that the population of Woodland has grown more rapidly at a rate of 2.4% annually from 1995-2005. Household size is estimated at about 2.9 persons per household and the number of households totaled 18,500 in 2004.

Woodland is the County seat of Yolo County. The City has substantial agriculture basis in its economy and is surrounded on all sides by productive land. Corn, tomatoes, alfalfa, sugar beets, safflower and wheat are important crops. Also, several companies in the City carry out significant seed research and development work. The local groundwater basin's natural recharge is supplemented by percolating irrigation water imported for farming.

The City is an important product distribution center due to its proximity to the Sacramento International Airport (just 15 minutes away), and Interstate-5, which traverses the City's north side.

Table 3 shows historical population for the City from 1970-2000. Table 4 shows the population total for the City from the year 2005, with projections to the year 2030.

**Table 3: Historical Population Figures for Woodland**

| Year | City of Woodland Population |
|---|---|
| 1970 | 20,677 |
| 1975 | 25,300 |
| 1980 | 30,235 |
| 1985 | 33,034 |
| 1990 | 39,802 |
| 1995 | 42,900 |
| 2000 | 49,151 |

**Table 4: Population Projections for the Woodland[a]**

| Year: | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|---|
| City of Woodland Population | 53,382[b] | 58,093 | 62,509 | 69,719[c] | 72,518 | 73,000[d] |

(a) SACOG
(b) California Department of Finance's Demographics Research Department
(c) Build-out of the Spring Lake Specific Plan Area and Master Plan Remainder Area per City of Woodland Resolution No. 4636
(d) Full build-out is projected to occur in the year 2026 with a population of about 73,000

## 1.3.4 Past Drought, Water Demand, and Conservation Information

### 1.3.4.1 Past Drought

The local region experienced a two-season "drought" in 1975/1976 and 1976/1977. Rainfall was less than 50 percent of normal during each of these seasons. Average groundwater levels dropped 40 feet below normal during summers. The City lowered pumps in existing wells and drilled some new wells in response to the lowered water levels. Many local agriculture supply wells were deepened during this same time. Woodland has met all water demands throughout its history.

#### 1.3.4.2 Water Demand

Population has increased by 8.6% since 2000. In 2000, groundwater produced to meet the demand of that population was 16,831 AF. In the last five years water demand per person has declined from approximately 300 gallons per day to 275 gallons per day.

#### 1.3.4.3 Conservation Information

Water conservation has been implemented in the City through such programs as low water use plumbing fixture retrofits.

Solid waste management efforts can help increase water supply reliability by reducing use as well as the risk of supply contamination. The City has implemented and supports various programs to increase waste reduction, reuse, recycling, and the safe handling of household hazardous wastes. "Grass-cycling," for example, returns moisture to soil and plants, thereby reducing loss of moisture from evaporation. Woodland also works with Yolo County government and other cities to provide residents with free household hazardous waste management programs six times annually. Protection efforts include neighborhood efforts and management of landfill leachate.

#### 1.3.4.4 Agricultural Water Conservation Programs

The City works with the Yolo County Flood Control and Water Conservation District to carry out water planning and projects on a regional level. The District supplies irrigation water to agricultural land near Woodland. The City cooperates with the City of Davis, City of West Sacramento, the University of California-Davis, the Yolo County Flood Control and Water Conservation District (YCFCWCD), farmers, and Yolo County government through the Water Resources Agency of Yolo County.

## 1.4 Review of Implementation of UWMP

> 10643. An Urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.

City staff has reviewed the 2000 Urban Water Management Plan and implementation schedule. There are required implementation dates. The City was exempt from several demand management measures. The City has insured water supply reliability by retrofitting existing wells and installed a new well to be online in 2006. The City will continue its education outreach programs for water conservation. The City is participating in the WRA to develop an Integrated Regional Water Management Plan (IRWMP) for Yolo County and cities within the County. A dedicated staff position for water conservation was requested in FY 2005-2006 but it was not approved due to limited funding. The City will implement other required demand management measures as funding becomes available.

# Section 2: Water Sources (Supply)

> 10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:
>
> 10631 (b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments to 20 years or as far as data is available.

The City is dependent on groundwater. The groundwater basin is recharged by rainfall and imported surface water, which is conveyed through earthen canals and creek beds. Table 5 shows the historic and current groundwater usage in Woodland.

**Table 5: Historic Well Production (AFY)**

| Water Supply Sources | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|---|
| City produced groundwater | 17,166 | 16,832 | 17,018 | 16,705 | 15,917 | 16,377 |

## 2.1 Water Supply Sources

Table 6 summarizes current and projected quantities of water by supply source. The City operates 19 groundwater wells with the most recent addition in early November 2005. An additional well is scheduled to be online in December 2005. Water supply is assumed to be 2/3 of the City's current and projected well capacity due to demand, maintenance, and seasonal production of the wells.

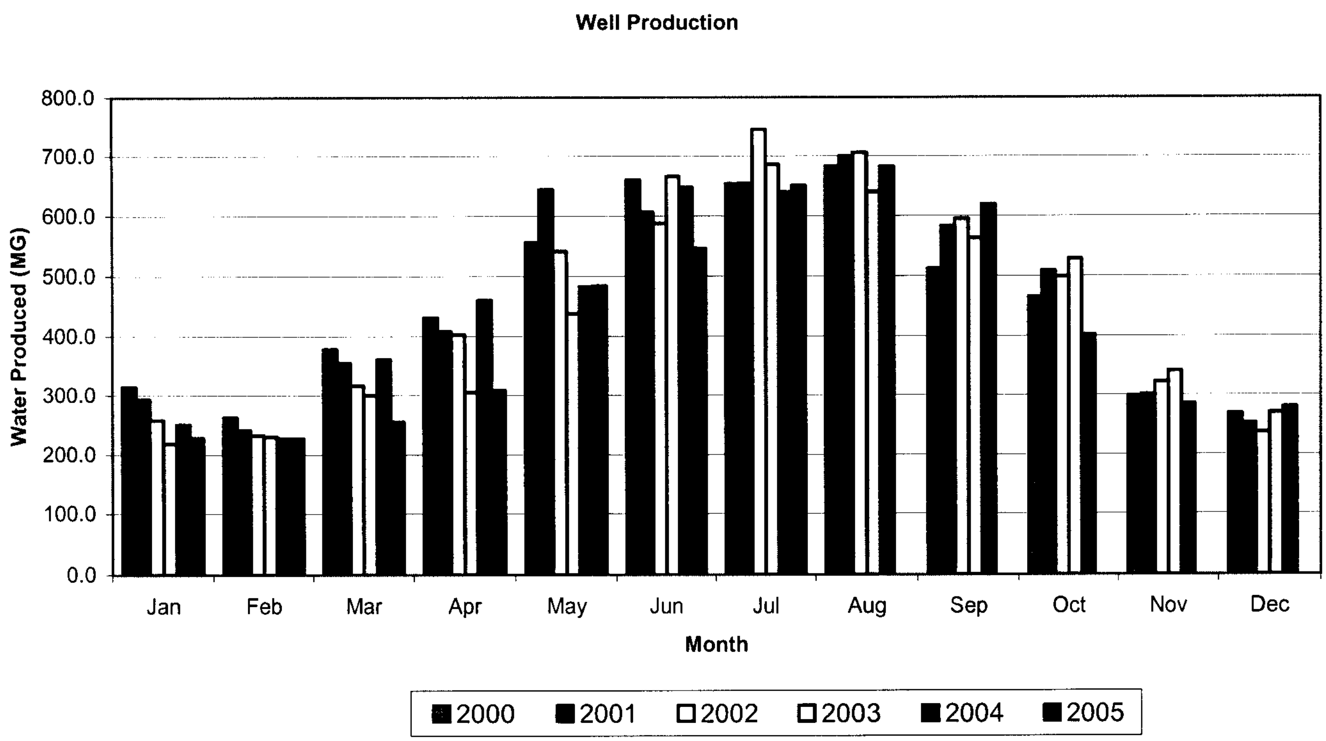
**Table 6: Current and Projected Water Supplies (AFY)**

| Water Supply Sources | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|---|
| Water supply available from wells | 38,522 | 42,823 | 49,274 | 55,726 | 60,027 | 60,027 |

## 2.2 Groundwater

The City expects to pump approximately 17,800 acre-feet from 19 wells in 2005. The average depth to water varies between 25 feet above to 40 feet below sea level during a normal year. Water is a relatively high in dissolved solids and is very hard, but water quality is within standards set for acceptable drinking water by the federal government and the California Department of Health Services (DHS). The City pumps the groundwater on an "as needed" basis. Wells are operated to maintain target water system pressures. Figure 2 presents groundwater well production from the last five years.

**Figure 2: Historic Monthly Well Production (MG)**




The City has conducted a feasibility study on conjunctive use of Sacramento River water. The City is also contributing to an environmental review related to cooperating with the YCFCWCD, the City of Davis, and UC Davis to extend the supply of surface water to each of the entity's service area.

## 2.2.1 Basin Description

### 2.2.1.1 Boundaries and Hydrology

The Yolo Subbasin, located in the southern portion of the Sacramento Valley Basin primarily within Yolo County. It is bounded on the east by the Sacramento River, on the west by the Coast Range, on the north by Cache Creek, and on the south by Putah Creek. The basin is roughly bisected by an anticlinal structure, but otherwise is gently sloping from west to east with elevations ranging from approximately 400 feet at the base of the Coast Range to the west to nearly sea level in the eastern areas. Major cities within the subbasin include Davis, West Sacramento, Winters, and Woodland. Precipitation averages approximately 20 to 24 inches per year in the western portion of the subbasin, and approximately 18 to 20 inches per year in the eastern portion of the subbasin.

### 2.2.1.2 Hydrogeologic Information

***Water Bearing Formations***

The primary water bearing formations comprising the Yolo subbasin are sedimentary continental deposits of Late Tertiary (Pliocene) to Quaternary (Holocene) age. Fresh water-bearing units include younger alluvium, older alluvium, and the Tehama Formation (Olmstead, 1961 and DWR, 1978). The cumulative thickness of these units ranges from a few hundred feet near the Coast Range on the west to nearly 3000 feet near the eastern margin of the basin. Saline water-bearing sedimentary units underlie the Tehama formation and are generally considered the boundary of fresh water (Berkstresser, 1973).

Younger alluvium includes flood basin deposits and recent stream channel deposits. Flood basin deposits occur along the eastern margin of the subbasin in the Yolo Flood Basin. They consist primarily of silts and clays, but along the eastern margin of the subbasin may be locally interbedded with stream channel deposits of the Sacramento River. Thickness of the unit ranges from 0 to 150 feet. The flood basin deposits have low permeability and generally yield low quantities of water to wells. The quality of ground water produced from the basin deposits is often poor.

Recent stream channel deposits consist of unconsolidated silt, fine- to medium-grained sand, gravel and occasionally cobbles deposited in and adjacent to active streams in the subbasin. They occur along the Sacramento River, Cache Creek, and Putah Creek. Thickness of the younger alluvium ranges from 0 to 150 feet.

The younger alluvium varies from moderately to highly permeable, but often lies above the saturated zone. Where saturated, the younger alluvium yields significant quantities of water to wells.

Older alluvium consists of loose to moderately compacted silt, silty clay, sand, and gravel deposited in alluvial fans during the Pliocene and Pleistocene. Thickness of the unit ranges from 60 to 130 feet, about one quarter of which is coarse sand and gravel. Permeability of the older alluvium is highly variable. Wells penetrating sand and gravel lenses of the unit produce between 300 and 1000 gpm. Adjacent to the Sacramento River, wells completed in ancestral Sacramento River stream channel deposits yield up to 4000 gpm. Wells completed in the finer-grained portions of the older alluvium produce between 50 and 150 gpm.

The Tehama Formation is the thickest water-bearing unit underlying the Yolo subbasin, ranging in thickness from 1500 to 2500 feet. Surface exposures of the Tehama Formation are limited mainly to the Coast Range foothills along the western margin of the basin, as well as in the Plainfield Ridge. The Tehama consists of moderately compacted silt, clay, and silty fine sand enclosing lenses of sand and gravel, silt and gravel, and cemented conglomerate. Permeability of the Tehama Formation is variable, but generally less than the younger units. Because of its relatively greater thickness, however, wells completed in the unit can yield up to several thousand gallons per minute.

Underlying the Tehama Formation are brackish to saline water-bearing sedimentary units, including the somewhat brackish sedimentary rocks of volcanic origin (Pliocene to Oligocene) underlain by marine sedimentary rocks (Oligocene to Paleocene) which are typically of low permeability and contain connate water (Olmstead, 1961). The upper contact of these units generally coincides with the fresh/saline water boundary. The contact is found near the Coast Range at depths as shallow as a few hundred feet. Near the eastern margin of the basin it reaches depths of nearly 3000 feet.

### *Subsurface Flow Controls*

The geologic structure of the groundwater subbasin is dominated by an anticlinal ridge oriented northwest to southeast, which is expressed at the surface as the Dunnigan Hills and Plainfield Ridge. The anticlinal structure impedes subsurface flow from west to east. Subsurface groundwater outflow sometimes occurs from the Yolo subbasin into the Solano subbasin to the south. Subsurface outflow and inflow may also occur beneath the Sacramento River to the east with the South and North American subbasins. Subsurface groundwater inflow may occur from the west out of the Capay Valley Basin.

### *Groundwater Level Trends*

Groundwater levels are impacted by periods of drought due to increased groundwater pumping and less surface water recharge (e.g. in the late 1970's and early 1990's), but recover quickly in "wet" years. Long-term trends do not indicate any significant decline in water levels, with the exception of localized pumping depressions in the vicinity of the Davis, Woodland and Dunnigan/Zamora areas. Past studies (Scott, 1975) have concluded that the Yolo subbasin is subject to overdraft, however the completion of Indian Valley Reservoir in 1976 provided significant relief in the form of additional available surface water (YCFCWCD, 2000).

### *Groundwater Storage*

Many studies have been conducted to determine the groundwater storage within parts or all of Yolo County. Several of these studies refer to calculations completed by Scott and Scalmanini in their 1975 report, Investigations of Groundwater Resources, Yolo County. Groundwater storage capacity for the entire county for groundwater aquifer depths between 20 and 420 feet was calculated as 14,038,000 acre-feet based on subtotals from six separate study areas. Specific yields were calculated, based on well log information, for three separate depth intervals within six study areas, and ranged from 6.5% to 9.7%.

### *Groundwater Storage Capacity*

From the Scott and Scalmanini calculations it can be roughly estimated that the Yolo Subbasin, (defined in this report as a portion of the county) has a total storage capacity of roughly 6,456,000 acre-feet for depths between 20 and 420 feet (see below). A summary of groundwater storage capacity is presented in Table 7.

**Table 7: Storage Capacity of Yolo Subbasin**

| Groundwater Basin (Scott, 1975) | Area (acres) | Calculated Gross Storage Capacity (Scott, 1975) | Estimated % area within Yolo Subbasin[a] | Estimated Storage Capacity within Yolo Subbasin |
|---|---|---|---|---|
| Cache Creek | 45,800 | 1,678,100 | 20% | 335,620 |
| Upper Cache- Putah | 70,300 | 2,017,700 | 100% | 2,017,700 |
| Plainfield Ridge | 8,800 | 240,800 | 100% | 240,800 |
| Lower Cache-Putah | 97,300 | 2,876,900 | 95% | 2,733,055 |
| Colusa | 95700 | 2709800 | 0% | 0 |
| Yolo Bypass | 129,100 | 4,514,700 | 25% | 1,128,765 |
| **Totals** | **447,000** | **14,038,000** | | **6,455,940** |

(a) Represents the portion of each Groundwater Basin (as defined by Scott, 1975) that is contained within the Yolo Subbasin (as defined by the DWR). DWR staff estimated percentages.

#### *Groundwater in Storage*

Groundwater storage between the depths of 20 to 420 feet in 1974 for all of Yolo County was calculated to be 13,208,400 acre-feet (Scott, 1975). Based on the the1975 report, Investigations of Groundwater Resources, Yolo County by Scott and Scalmanini, groundwater storage within the Yolo Subbasin for 1974 is estimated at 6,074,220 acre-feet (see below).

#### *Groundwater Budget (Type C)*

Currently no groundwater budget has been calculated for the Yolo Subbasin (see comments below).

#### *Groundwater Quality*

Groundwater found within the subbasin is characterized as a sodium magnesium, calcium magnesium, or magnesium bicarbonate type. The quality is considered good for both agricultural and municipal uses, even though it is hard to very hard overall (generally over 180 mg/l CaCO3). Selenium and boron are found in higher concentrations locally (Evenson, 1985). Total dissolved solids range from a of 107 ppm to 1300 ppm and average 574 ppm, based on Title 22 data obtained from public supply water well samples (DHS, 2000). Localized impairments include elevated concentrations of boron (as high as 2 to 4 ppm) in groundwater along Cache Creek and in the Cache Creek Settling Basin area, increased levels of selenium present in the groundwater supplies for the City of Davis, and localized areas of nitrate contamination (YCFCWCD 1992) (Evenson, 1985).

### 2.2.2 Location, Amount and Sufficiency of Groundwater Pumped for Last Five Years

Municipal water demand in Woodland is met entirely with local groundwater. The City supply is drawn from the intermediate groundwater aquifer located from approximately 200 to 600 feet below land surface. For all City well locations, the average annual depth to groundwater is about

60 feet falling to over 100 feet in June. Although groundwater levels are subject to broad seasonal fluctuations, overall levels in recent years have been stable and the source has been adequate and reliable. Table 8 presents the groundwater production for each well over the last five years.

### Table 8: City of Woodland Water Production Summary

| | | 2000 | | 2001 | | 2002 | | 2003 | | 2004 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Well No. | Location | Well Total (MG) | Well Total (AF) | Well Total (MG) | Well Total (AF) | Well Total (MG) | Well Total (AF) | Well Total (MG) | Well Total (AF) | Well Total (MG) | Well Total (AF) |
| 1 | Fifth Street | *112.2* | 344.2 | *69.9* | 214.5 | *96.7* | 296.7 | *12.0* | 36.9 | *8.5* | 26.0 |
| 4 | Christiansen | *0.2* | 0.5 | *120.4* | 369.5 | *34.5* | 105.8 | *12.8* | 39.3 | *3.1* | 9.6 |
| 5 | Southland | *315.5* | 968.4 | *637.2* | 1955.5 | *279.2* | 856.8 | *229.8* | 705.3 | *121.5* | 373.0 |
| 6 | Grand Avenue | *43.2* | 132.5 | *38.7* | 118.7 | *60.0* | 184.0 | *246.8* | 757.5 | *587.4* | 1802.9 |
| 9 | Tredway | *0.1* | 0.3 | *0.1* | 0.2 | *0.1* | 0.4 | *0.2* | 0.5 | *0.1* | 0.3 |
| 10 | Davis Estates | *974.6* | 2991.2 | *824.6* | 2530.8 | *612.4* | 1879.5 | *584.5* | 1794.0 | *484.3* | 1486.4 |
| 11 | Whitehead | *520.2* | 1596.4 | *731.0* | 2243.5 | *720.2* | 2210.4 | *610.4* | 1873.5 | *535.5* | 1643.5 |
| 12 | Ventura | *50.7* | 155.7 | *6.1* | 18.8 | *12.2* | 37.5 | *8.8* | 26.9 | *25.2* | 77.5 |
| 13 | Best | *782.2* | 2400.5 | *757.7* | 2325.5 | *571.6* | 1754.2 | *901.1* | 2765.6 | *908.1* | 2787.0 |
| 14 | Freeway Park | *374.2* | 1148.5 | *434.7* | 1334.2 | *360.6* | 1106.6 | *351.9* | 1079.9 | *268.4* | 823.6 |
| 15 | Campbell Park | *319.7* | 981.2 | *165.1* | 506.6 | *227.4* | 697.8 | *169.2* | 519.3 | *136.6* | 419.3 |
| 16 | Crawford Park | *230.5* | 707.5 | *200.2* | 614.4 | *454.7* | 1395.4 | *283.8* | 871.1 | *483.9* | 1485.2 |
| 17 | Borchard | *738.8* | 2267.4 | *696.8* | 2138.4 | *707.8* | 2172.2 | *666.9* | 2046.8 | *280.1* | 859.7 |
| 18 | Fairgrounds | *2.4* | 7.4 | *0.9* | 2.7 | *9.3* | 28.7 | *0.2* | 0.5 | *171.4* | 526.1 |
| 19 | Sutter Yard | *309.4* | 949.5 | *260.9* | 800.6 | *444.0* | 1362.8 | *385.5* | 1183.2 | *369.0* | 1132.5 |
| 20 | West Court St. | *387.2* | 1188.2 | *127.9* | 392.7 | *278.0* | 853.1 | *166.6* | 511.4 | *176.3* | 541.0 |
| 21 | Schuler Ranch | *0.4* | 1.1 | *0.6* | 1.9 | *0.5* | 1.4 | *0.3* | 0.9 | *0.1* | 0.3 |
| 22 | E. Gum Avenue | *322.6* | 990.1 | *472.5* | 1450.3 | *575.3* | 1765.7 | *555.3* | 1704.4 | *776.6* | 2383.4 |
| 26 | Regional Park | *Well online in November 2005* | | | | | | | | | |
| **Annual Total** | | *5,483.9* | 16,831 | *5,545.2* | 17,019 | *5,444.3* | 16,709 | *5,186.3* | 15,917 | *5,336.2* | 16,377 |

(a) City of Woodland Well Production Summaries, 2000-2004

## 2.2.3 Amount and Location of Groundwater Projected to be Pumped

Groundwater has served as a reliable source of supply for Woodland. The primary questions regarding its future use relate primarily to the potential impact of increased demand on groundwater levels and the quality of the water itself.

Woodland presently plans to meet the projected need for supplemental water by adding 10 new wells to the existing 19 wells over the next twenty years. The new wells would be located within the intermediate aquifers, as well as the deep aquifer, located 600 to 1,100 feet below land surface. As demand increases, new wells would be constructed, and where possible, extraction rates would be increased at existing wells.

The proposed new wells would be generally located in growth areas and would be integrated into the distribution system by extending existing pipelines. A remote well field, located in the southeast portion of the service area was analyzed and subsequently rejected by the City as a viable alternative to more scattered well locations. (Remote Well Field Feasibility Study, GeoTrans, 2002)

## 2.3 Recycled Water

The City's wastewater treatment facility uses oxidation ditches to produce secondary treatment effects and is in the process to construct tertiary facilities with UV disinfection. The facility receives inflows of more than 7,200 acre-feet per year. Most of the treated water is discharged to a large unimproved channel that eventually drains to the Tule Canal on the east side of the Yolo Bypass. A 1996 study concluded that it was economically infeasible to supply treated wastewater to a planned golf course. Treated wastewater costs were estimated to be six times higher than groundwater delivery costs.

The City recently examined the feasibility of reusing groundwater from the Beamer Underpass Pumping Station at a cooling tower at the Woodland Biomass facility, a local electrical power generating plant. The study is further discussed in the Water Recycling section.

## 2.4 Existing Treatment and Distribution Facilities

The City has one elevated water tank, located in Camerena Park at Beamer and Walnut Streets. It was built in 1954, is 115 feet high, and has a capacity of 300,000 gallons. The vented tank does not contribute significant storage to the system, but rather is used to stabilize water pressures throughout the distribution system. The City water distribution system is within one pressure zone and is served through pipelines ranging in size from 2 to 12 inches in diameter.

# Section 3: Reliability Planning

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

10631 (c) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable.

10631 (c) For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to replace that source with alternative sources or water demand management measures, to the extent practicable.

10631 (c) Provide data for each of the following:
(1) An average water year, (2) A single dry water year, (3) Multiple dry water years.

10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:

10632 (b) An estimate of the minimum water supply available during each of the next three-water years based on the driest three-year historic sequence for the agency's water supply.

## 3.1 Reliability

Water supply reliability is a measure of a water purveyor's ability to deliver uninterrupted water service. Reliability planning requires information about: (1) the expected frequency and severity of shortages; (2) how additional water management measures are likely to affect the frequency and severity of shortages; (3) how available contingency measures can reduce the impact of shortages when they occur.

Groundwater has served as a reliable source of supply for the City of Woodland. The primary questions pertaining to the future use of groundwater as a supply relate to the impact of increased demand on groundwater levels, water quality, aging wells, and changes in water law regarding local basin management. At the present time, the City can continue to rely on its underlying groundwater aquifer. However, potential changes listed above may be costly to the City in the future including well replacements and wellhead treatment systems.

In the event of severe drought, the following items will help the community mitigate impacts: (1) the City's Water Conservation Regulations Ordinance (Appendix D); (2) voluntary water use cutbacks on the part of the community; and (3) effective water conservation programs.

## 3.2 Frequency and Magnitude of Supply Deficiencies

The City experienced lower than normal rainfall events during the 1975-76 and 1976-77 seasons wherein less than one-half the average rainfall was received. During the last statewide critical water shortage— the 1987-1992 drought—Woodland received 82 percent of average rainfall.

During this period groundwater was exported from parts of Yolo County to areas outside of the County through a state water-banking program.

Findings from the groundwater modeling conducted in a 2002 study (GeoTrans, 2002) indicate that the effect of continued extraction to meet existing and new demand will be to lower water levels an average of about seventeen (17) feet at the City center. Once water levels stabilize at new levels after urban buildout, long-term impacts from the increased municipal extraction, such as land subsidence, are projected to be minor. The impacts of lower groundwater levels would include higher municipal and agricultural pumping costs.

## 3.3 Plans to Assure a Reliable Water Supply

### 3.3.1 Groundwater Availability

Historically, the City has met new water demand by building new wells within developing residential and urban areas. According to the City's Surface Water Supply Feasibility Study, Woodland presently plans to meet the projected need for supplemental water by adding 10 new wells to the existing 19 wells over the next twenty years. The new wells would be located within the intermediate aquifers, as well as the deep aquifer, located 600 to 1,100 feet below land surface. As demand increases, new wells would be constructed, and where possible extraction rates would be increased at existing wells.

The proposed new wells would be generally located in growth areas and would be integrated into the distribution system by extending existing pipelines. A remote well field, located in the southeast portion of the service area was analyzed and subsequently rejected by the City as a viable alternative to more scattered well locations (Remote Well Field Feasibility Study, GeoTrans, 2002). The feasibility of a surface water project is not affected by the inclusion or exclusion of the well field from the City's water supply system.

### 3.3.2 Surface Water Availability

In 1999, the City completed a water supply master plan that investigated ways both to improve the quality of water supplied to its customers and to expand the water supply to meet future growth in demand. The City determined that a better surface water source would be compatible with both of these objectives. The Sacramento River was identified as potentially the most feasible source of surface water for the City.

The proposed surface water project for Woodland would rely upon the annual diversion of up to 15,000 AF of water from the Sacramento River. This diversion would be based upon the successful future granting of a water right under the terms of the 1994 surface water right filed with the State Water Resources Control Board (SWRCB) on behalf of the City and other parties. Yolo County Flood Control and Water Conservation District (YCFCWCD) submitted water right application 30358 on behalf of YCFCWCD, City of Woodland, City of Davis, Town of Winters and UC Davis for an annual diversion of 45,000 AF from the Sacramento River for municipal uses within Yolo County. While no allocation of water among the parties was specified in the application, subsequent revisions to water plans made by each of the parties to the application and the withdrawal of the Town of Winters led to a decision to allocate the water among three of the applicants, giving 15,000 AF annually to Woodland.

Surface water diverted under the 15,000 AF water right application could provide about 85% of the City's present total annual water demand and about 60% of the projected water demand at buildout in 2026.

## 3.4 Reliability Comparison – Single Dry Year and Next Three Years

Table 9 details estimated water supply projections associated with several water supply reliability scenarios. For further information on the data, see the Water Shortage Contingency Plan (Section 7) and the Water Service Reliability (Section 9).

**Table 9: Supply Reliability for Various Scenarios**

| Average/Normal Water Year 2005 (Volume) | Single Dry Water Year (Volume) | Next Three Years | | |
|---|---|---|---|---|
| | | Year 1 (Volume) 2006 | Year 2 (Volume) 2007 | Year 3 (Volume) 2008 |
| 38,522 | 38,522 | 38,522 | 38,522 | 38,522 |
| Unit of Measure: Acre-feet/Year | | | | |

The City has not experienced any reduction in the well production in the past during the drought in 1970's. The wells were able to produce enough water for the demand. Therefore, the supply reliability would be the same for average water year, single-dry water year, and multiple dry water years. The City did observe further draw down in the groundwater level. This was due to increased groundwater pumpage by other users.

## 3.5 Water Quality Impacts on Water Management Strategy and Supply Reliability

The DHS sets both primary and secondary water quality standards for drinking water. Primary standards are health-based. Secondary standards are related to palatability issues such as taste and odor, and scaling and corrosion of pipes.

The existing municipal groundwater supply meets Federal and State water quality standards for safe drinking water. However, compliance with some secondary water quality standards related to taste, odor or appearance, is less certain. The concentrations of total dissolved solids (TDS), boron, and nitrate are high compared to drinking water standards and compared to the quality of the water supply in many other towns and cities. The observed trend toward higher TDS concentrations in the City's groundwater supply is expected to continue, potentially affecting its acceptance and suitability for human consumption. Boron levels exceed recommended levels for optimum plant growth, affecting residential landscaping. Nitrate concentrations in the vicinity of Woodland have been rising slowly but continuously over several decades, making it necessary to isolate aquifer layers containing higher nitrate levels in two City wells so that the water produced would meet safe drinking water standards.

The hardness of Woodland's groundwater (average 374 mg/l), combined with the effects of costly household efforts to soften it, produces wastewater salinity concentrations that have been found to be of concern by the Regional Water Quality Control Board. Future wastewater discharge requirements may require the City to reduce electrical conductivity in its wastewater discharge to less than 700 µmhos/cm.

### 3.5.1 Groundwater Quality

Nitrate, boron, TDS and hardness present increasing problems for Woodland's existing groundwater supply. Related water quality problems are reflected in the limitations placed on uses and the significant resources that households expend in attempting to address and improve water quality. Plans that include deeper wells, well modification, and well rehabilitation do not assure solutions to water quality problems. The recent remote well field study (GeoTrans, 2002) concluded, "the City of Woodland is limited to the intermediate aquifers and surface water for its long-term supply", because the potential for finding better quality and adequate supply in the deeper zone was limited. In order to meet the potential Regional Water Quality Control Board's requirements for wastewater discharge, Woodland must either improve the quality of its source water, or incur very high treatment costs to improve the quality of the wastewater for discharge. Present wastewater quality problems result from the initial water quality problems of the source water and the impact of water softeners used by many customers.

### 3.5.2 Surface Water Quality

Surface water from the Sacramento River would improve the quality of water provided to City customers. Groundwater from the City wells has much higher hardness, boron, and nitrate concentrations than the surface water.

The hardness of the City's groundwater supply and the elevated boron concentration are two of the most significant problems for municipal customers. A surface water supply would provide substantial improvement for municipal users located near wells with the highest hardness and boron concentrations.

## 3.6 Transfer or Exchange Opportunities

> 10631 (d) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

The City is not exploring dry year water transfer options. It can be noted that in 1996, Yolo County adopted Ordinance 1195, which made it unlawful to extract groundwater underlying County for use outside County boundaries, without first obtaining a permit.

## 3.7 Desalination Opportunities

The City of Woodland is not considering opportunities for development of desalinated water as a long-term supply. In order to meet the Regional Water Quality Control Board's possible requirements for wastewater discharge, Woodland must either improve the quality of its source water, or incur very high treatment costs to improve the quality of the wastewater for discharge. Because present wastewater quality problems result from the initial water quality problems of the source water and the impact of water softeners used by many customers, the City will investigate the potential for improving source water quality, including the opportunity for desalination of the groundwater supply.

# Section 4: Water Use Provisions

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

10631 (e) (1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors including, but not necessarily limited to, all of the following uses:

(A) Single-family residential; (B) Multifamily; (C) Commercial; (D) Industrial; (E) Institutional and governmental; (F) Landscape; (G) Sales to other agencies; (H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof; and (I) Agricultural.

(2) The water use projections shall be in the same 5-year increments to 20 years or as far as data is available.

## 4.1 Historic Water Demand

The City is the water purveyor for most of the citizens living within City boundaries. At the present time, the City serves approximately 53,000 customers. Five recent years of water consumption records are available and are presented in Table 10, along with estimated population figures for the Woodland service area. The per capita water demand has declined historically and is presently about 275 gpcd.

**Table 10: City of Woodland Service Area Water Consumption Records**

| Year | Service Area Estimated Population[a] | Water Deliveries (ac-ft/yr)[b] | Estimated Daily Water Use (gpcd) |
|---|---|---|---|
| 1999 | 48,850 | 17,166 | 314 |
| 2000 | 49,151 | 16,832 | 306 |
| 2001 | 50,821 | 17,018 | 299 |
| 2002 | 51,360 | 16,705 | 290 |
| 2003 | 52,570 | 15,917 | 270 |
| 2004 | 53,382 | 16,377 | 274 |

(a) Source: California Department of Finance
(b) Source: City of Woodland

The City is currently not metered for residential customers but the City does keep water usage based on commercial, industrial, and institutional customer categories. The City will be required to read meters and bill customers who have meters and may install a different billing system to allow for better tracking of user categories and accounting of water use per each category. This will be crucial to observing the impacts of water conservation efforts implemented by the City through this Urban Water Management Plan. The City's available data on water consumption per user category is presented in Appendix E.

## 4.2 Current and Projected Water Use

Table 11 summarizes the City's water demand projections in five-year increments to 2030. The demands are water pumped from the wells into the distribution system including system losses. These numbers are different than the possible well production capacities listed in water supply sections. These projections are consistent with updated average use for the years 2000-2003 (16,600 AF/yr). Woodland's urban water demand is expected to grow at an annual rate of 2.5% from 2015-2030. Near-term growth is estimated at a higher rate to reflect the City's adoption of the Spring Lake Specific Plan. Based upon the projected rates of population growth, land absorption, water use and ultimate water demand, it is estimated that full buildout for the City will occur in the year 2026 with a population of about 73,000. By buildout, average water use per gross acre is projected to increase, with non-residential water use comprising a larger share of total consumption. Average per capita water demand for new residential consumers is expected to decrease to 167 gallons per capita per day based upon calculations of the incremental increases in population, residential acreage and water use.

**Table 11: Current and Projected Water Demands (Acre-Feet/Year)**

| Water Supply Sources | 2005 | 2010 | 2015 | 2020 | 2025 | 2030[(a)] |
|---|---|---|---|---|---|---|
| City produced groundwater | 15,158 | 18,924 | 22,588 | 23,402 | 24,118 | 24,800 |

(a) According to the City's General Plan, build-out is projected to occur in 2026.

The Tables 12 and 13 reflect past, current, and projected water use by customer classification and past current and projected number of connections by customer classification.

**Table 12: Past, Current and Projected Water Use (AF)**

| Water Use Sectors | 2000[(a)] | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|---|---|
| Single family residential | 6,820 | 7,849 | 9,799 | 11,697 | 12,118 | 12,489 | 12,843 |
| Multi-family residential | 3,410 | 3,925 | 4,900 | 5,848 | 6,059 | 6,244 | 6,421 |
| Commercial | 2,212 | 1,011 | 1,262 | 1,507 | 1,561 | 1,609 | 1,654 |
| Industrial | 361 | 165 | 206 | 246 | 255 | 263 | 270 |
| Institutional | 759 | 347 | 433 | 517 | 536 | 552 | 568 |
| Landscape/Recreation | 1,617 | 739 | 923 | 1,101 | 1,141 | 1,176 | 1,209 |
| Unmetered Uses | | | | | | | |
| Estimated System Losses at 8% | 1,320 | 1,123 | 1,402 | 1,673 | 1,734 | 1,787 | 1,837 |
| Total | 16,500 | 15,158 | 18,925 | 22,589 | 23,404 | 24,120 | 24,802 |

(a) City of Woodland Groundwater Pumping Records for 2000

**Table 13: Number of Connections by Customer Type**

| Customer Type | 2000 | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|---|---|
| Single family residential | 11,416 | 11,749 | 14,000 | 16,261 | 16,750 | 17,250 | 17,770 |
| Multi-family residential | 220 | 754 | 1,682 | 2,610 | 2,690 | 2,770 | 2,853 |
| Commercial | 823 | 839 | 968 | 1,042 | 1,162 | 1,209 | 1,217 |
| Industrial | 24 | 26 | 39 | 42 | 46 | 48 | 49 |
| Institutional and governmental [(a)] | | | | | | | |
| Landscape/recreation | 211 | 232 | 290 | 313 | 349 | 363 | 365 |
| Total | 12,694 | 13,600 | 16,979 | 20,267 | 20,997 | 21,640 | 22,253 |

(a) Included in Commercial sector

### 4.2.1 Residential Sector

Single family residential connections increased about 3% and multi-family residential connections showed a high increase (243%) in the last five years. The City Council of the City of Woodland passed Resolution No. 4636 in May, 2005 amending General Plan Policy 1.A.7 relating to the City's growth cap. The adoption of the Spring Lake Specific Plan and EIR in 2001 anticipated a higher population based on the 2000 census figures, and assumed a 69,719 population in 2020 for build-out of the Specific Plan area and Master Plan Remainder Area, including construction of 6,935 dwelling units comprised of approximately 5,000 single family dwellings and the remainder multi-family.

### 4.2.2 Commercial Sector

The City has a complex mix of commercial customers, including markets, antique stores, insurance offices, beauty shops, gas stations, office buildings, shopping centers and restaurants. This sector continues to grow at about three percent per year. Projections have been made based on 60 persons per commercial connection based on historical trends.

### 4.2.3 Industrial Sector

The City's industrial sector is primarily centered on warehousing and manufacturing. No major changes in past growth trends are expected to continue and projections have been made based upon 1500 persons per industrial connection based on historical trends.

### 4.2.4 Institutional/Governmental Sector

The City has a stable institutional/governmental sector, consisting primarily of local government, schools and a hospital. No major changes in past growth trends are anticipated. The institutional/government sector connections are included in the Commercial sector as noted in Tables 12 and 13.

### 4.2.5 Landscape/Recreational Sector

The City operates 30 park and recreational facilities totaling approximately 165 acres. According to the City's 1996 General Plan, approximately 80 acres is needed for additional parkland to serve new development within the existing City limits. Another 161 acres is needed to serve development outside of the City limits. These additional acres are based on the General Plan standard of 11 acres per 1,000 people. Continued use of high-tech irrigation monitoring and scheduling systems is expected. Future projections have been estimated using 200 persons per connection based on historical trends.

### 4.2.6 Agricultural Sector

The City provides no potable water services to agricultural land.

# Section 5: Supply and Demand Comparison Provisions

10635 (a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from the state, regional, or local agency population projections within the service area of the urban water supplier.

## 5.1 Supply and Demand Comparison

Table 14 compares current and projected water supply, and demand.

### Table 14: Projected Supply and Demand Comparison Under Normal Water Year

| Volume | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|---|
| Supply totals | 38,522 | 42,823 | 49,274 | 55,726 | 60,027 | 60,027 |
| Demand totals | 15,158 | 18,924 | 22,588 | 23,402 | 24,118 | 24,800 |
| Difference | 23,364 | 23,899 | 26,686 | 32,324 | 35,909 | 35,227 |
| Units of Measure: Acre-feet/Year | | | | | | |

The UWMP Act requires that water purveyors evaluate water demand and supply scenarios for periods of drought, wherein as little as 50 percent of the water supply may be available. Table 15 shows adequate water supply available to meet demand in the case of a 25% supply reduction in a single dry year, and successive multiple dry years where supply is reduced by 10, 25, and 50 percent in successive years.

### Table 15: Single Dry Year and Multiple Dry Water Years

| Water Supply Sources | Current Supply 2005 (Volume) | Single Dry Water Year (Volume) | Multiple Dry Water Years | | |
|---|---|---|---|---|---|
| | | | Year 1 (Volume) | Year 2 (Volume) | Year 3 (Volume) |
| Supply totals | 38,522 | 28,892 | 34,670 | 28,892 | 19,261 |
| Percent Shortage | 0 | 25 | 10 | 25 | 50 |
| Demand totals | 15,158 | 15,158 | 15,158 | 15,158 | 15,158 |
| Difference | 23,364 | 13,734 | 19,512 | 13,734 | 4,103 |
| Unit of Measure: Acre-feet/Year | | | | | |

Table 16 shows that if the groundwater supply available were supplemented with surface water from the Sacramento River, no shortages would occur. The total proposed allotment from the Sacramento River of 15,000 AF would be available in the first year of the multiple dry year scenario, 10,000 AF available in the second year and 5,000 AF available in the third year.

### Table 16: Reliability and Comparison with Supply Options

| Water Supply Sources | Average / Normal Water Year | Single Dry Water Year | Multiple Dry Water Years Year 1 | Multiple Dry Water Years Year 2 | Multiple Dry Water Years Year 3 |
|---|---|---|---|---|---|
| Supply totals | 53,522 | 53,522 | 53,522 | 48,522 | 43,522 |
| Demand totals | 15,158 | 15,158 | 15,158 | 15,158 | 15,158 |
| Difference | 38,364 | 38,364 | 38,364 | 33,364 | 28,364 |
| Unit of Measure: Acre-feet/Year | | | | | |

Table 17 shows a scenario where demand reductions would take place in response to a drought or other catastrophic event. Supplemental water would not be available.

### Table 17: Reliability and Comparison with Demand Options

| Water Supply Sources | Average / Normal Water Year | Single Dry Water Year | Multiple Dry Water Years Year 1 | Multiple Dry Water Years Year 2 | Multiple Dry Water Years Year 3 |
|---|---|---|---|---|---|
| Supply totals | 38,522 | 38,522 | 38,522 | 38,522 | 38,522 |
| Demand totals | 15,158 | 13,642 | 15,158 | 13,642 | 12,884 |
| Percent demand reduction | 0 | 10 | 0 | 10 | 15 |
| Difference | 23,364 | 24,880 | 23,364 | 24,880 | 25,638 |
| Unit of Measure: Acre-feet/Year | | | | | |

# Section 6: Water Demand Management Measures (DMMs)

> 10630 It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied.
>
> 10631 (f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:
> (1) A description of each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures, including, but not limited to, all of the following:

The City is committed to implementing economically feasible programs that promote efficient water use and continues to implement demand management measures wherever practicable. However, some of the DMMs are costly to incorporate. The City is a medium sized water system utilizing groundwater from unadjudicated groundwater basin. The number of customers and the water supplied by the City is not comparable to many other larger water systems. It appears, from Section 10630 of the Water Code, that it is the intention of the Legislature to allow different levels of water management planning based on system size. The City has, to the best of its availability, dedicated its staff time and financial resources to implement the applicable DMMs to the extent possible. Since preparation of the 2000 UWMP, the City has hired a Conservation Coordinator for outreach and education programs. The City has also hired an Environmental Analyst to manage environmental programs, including water conservation.

The City provides financial incentives such as rebates for Ultra Low Flush toilets, distribution of low flow showerheads and garden hose nozzles, and metering with commodity rates. In addition, the City provides conservation presentations to local public schools and provides conservation resources to the public on the City's website.

Many of the DMMs have been evaluated for cost-effectiveness and results show cost/benefit analyses well below 1.00. For those DMMs not implemented, a cost/benefit summary is provided, along with assumptions that were incorporated into the analysis. Details may be found in Appendix F.

## 6.1 DMM1 – Water Survey Programs for Single-and Multi-family Residential Customers

This program is not currently implemented by the City.

The Cost benefit summary is provided below:

| | |
|---|---|
| Total Costs | $7,060,000 |
| Total Benefits | $695,000 |
| Discount Rate | 4.1% |
| Time Horizon | 20 |
| Cost of Water ($/AF) | 1,610 |
| Average Annual Water Savings (over 20 year period, AF/yr) | 198 |

## 6.2 DMM2 – Residential Plumbing Retrofit

### 6.2.1 Implementation Description

DMM-2 requires that low-flow fixtures be installed to replace non low-flow plumbing fixtures.

There are two components to DMM-2 to account for different values of water saved.

1. Check toilet flow rates and install ULFT as required, and
2. Check showerhead flow rates and install low-flow showerheads as required.

### 6.2.2 Implementation Schedule:

The City distributes about 500 low-flow showerheads per year.

### 6.2.3 Methods to Evaluate Effectiveness

The City evaluates this effectiveness of this DMM by tracking on the number of shower heads distributed to the public.

### 6.2.4 Conservation Savings

The City estimates that an average of five gallons per day per household is conserved in households that replace a high-flow showerhead with a low flow showerhead (Vickers, p. 88).

### 6.2.5 Budget

$3,000 annually is budgeted for showerhead distribution.

## 6.3 DMM3 – Water System Water Audits, Leak Detection and Repair

This program is not currently implemented by the City.

The cost benefit summary is provided below:

| | |
|---|---|
| Total Costs | $348,000 |
| Total Benefits | $282,000 |
| Discount Rate | 4.1% |
| Time Horizon | 20 |
| Cost of Water ($/AF) | 8 |
| Average Annual Water Savings (over 20 year period, AF/yr) | 400 |

## 6.4 DMM4 – Metering with Commodity Rates

This program is currently implemented by the City on a limited basis. DMM-4 requires that all non-metered accounts be retrofitted and that a pricing schedule based on the amount of water use be instituted. The City is fully metered for all non-residential sectors and meters have been installed in new residential construction since 1992. Currently those 11,749 single-family accounts and 1 multi-family account that are metered are charged a flat rate, not according to the volume of water consumed. With the recent passage of Assembly Bill 2572, the City will read and bill existing customers with meters by 2010 and will install, read, and bill all customers based on water usage by 2025. Industrial, commercial, and institutional accounts are charged according to metered consumption. Upon implementation, commercial, institutional and governmental accounts that have substantial landscaping areas will have separate meters.

The Cost benefit summary for additional implementation of this DMM is provided below:

| | |
|---|---|
| Total Costs | $6,002,000 |
| Total Benefits | $608,000 |
| Discount Rate | 4.1% |
| Time Horizon | 20 |
| Cost of Water ($/AF) | 306 |
| Average Annual Water Savings (over 20 year period, AF/yr) | 880 |

## 6.5 DMM5 – Large Landscape Conservation Programs and Incentives

The City currently implements this program on a limited basis. DMM-5 requires agencies to provide non-residential customers with support and incentives to improve their landscape water use efficiency.

The City maintains 30 major landscaped recreation facilities totaling 165 acres, 60 percent of which is estimated to be irrigated. 18 of these 30 facilities are equipped with automatic water systems that are adjusted weekly to correct for changing plant evapotranspiration using climatological data. Timers are adjusted to allow replenishment of water storage lost during the previous week.

The Cost benefit summary for additional implementation of this DMM is provided below:

| | |
|---|---|
| Total Costs | $139,000 |
| Total Benefits | $53,400 |
| Discount Rate | 4.1% |
| Time Horizon | 20 |
| Cost of Water ($/AF) | 58 |
| Average Annual Water Savings (over 20 year period, AF/yr) | 71 |

## 6.6 DMM6 – High-efficiency Washing Machine Rebate Programs

This program is not currently implemented by the City. DMM-6 requires the water agency to offer a financial incentive, if cost effective, for the purchase of high-efficiency clothes washing machines (HEWS) meeting a water factor value of 9.5 or less.

Any financial incentive offered shall be not less than the marginal benefits of the water savings, reduced by the necessary expense of administering the incentive program. A water agency is not required to implement a financial incentive program if the maximum cost-effective financial incentive is less than $50.

The preliminary cost benefit summary is provided below:

| | |
|---|---|
| Total Costs | $396,000 |
| Total Benefits | $ 1,900,000 |
| Discount Rate | 4.1% |
| Time Horizon | 20 |
| Cost of Water ($/AF) | 827 |
| Average Annual Water Savings (over 20 year period, AF/yr) | 478 |

The City did not implement this DMM since 2000 due to cost. In FY 2004-2005, the City budgeted funds to implement this DMM along with other residential water saving devices. The cost of shower heads and toilet rebates exhausted the funding prior to the high-efficiency washing machine rebate. The City will implement this program in 2006-2007 fiscal year.

## 6.7 DMM7 – Public Information Programs

The City currently provides water conservation information on its website http://www.cityofwoodland.org/pubworks/WaterConserv/WaterConserv.htm

Program should include, but is not limited to, providing speakers to employees, community groups and the media; using paid and public service advertising; using bill inserts; providing information on customers' bills showing use in gallons per day for the last billing period compared to the same period the year before; providing public information to promote water conservation practices; and coordinating with other government agencies, industry groups, public interest groups, and the media. Currently, the City is implementing this DMM by participating in the WRA which is gathering and developing information on regional water issues. Two public input meeting were held on December 1, 2005 in the City of Woodland Council Chambers for the Integrated Regional Water Management Plan (IRWMP). The City also sends out and makes available "Water Wise" brochures, as seen in Appendix G, to the public. In addition, the City pays for a pre-show public service advertising in a movie theatre, with 5 screens. The advertisement starts at the beginning of each movies and includes three ad frames which is on the screen for 8-12 seconds. A copy of the ad frames is included in Appendix F.

The cost benefit summary for full implementation of this DMM is provided below:

| | |
|---|---|
| Total Costs | $695,000 |
| Total Benefits | $696,000 |
| Discount Rate | 4.1% |
| Time Horizon | 20 |
| Cost of Water ($/AF) | 193 |
| Average Annual Water Savings (over 20 year period, AF/yr) | 170 |

## 6.8 DMM8 – School Education Programs

### 6.8.1 Implementation Description

The City conducts classroom education programs. The City began the Earth Capades program in FY 2003-2004 and presented 20 times in local schools and reached approximately 8,000 students every year. In FY 2005-2006, twenty performances are scheduled of which one performance will be at a middle school and the remaining 19 performances will be in elementary schools targeting grades 1 through 6. The plays focus on the environment, specifically recycling, water conservation and stormwater pollution prevention. One half of the budget for these presentations is provided by the Water Conservation component of Environmental Programs. A "Water Wise" brochure is also handed out during school education programs.

### 6.8.2 Implementation Schedule

The City plans to continue to offer educational plays at school when funding is available.

### 6.8.3 Methods to Evaluate Effectiveness

The City evaluates the effectiveness of the program by reviewing the number of students attending the program as well as teacher surveys. The City also tracks the number of community feed back.

### 6.8.4 Conservation Savings

Education of public school children about ways to save water both at school and at home can have a wide-reaching impact. Children often relate what they learn at school to their families. Reductions in water using habits resulting from school education programs are therefore difficult to quantify.

### 6.8.5 Budget

The City spends approximately $12,000 per year to provide these presentations to the local school children.

## 6.9 DMM9 – Conservation Programs for Commercial, Industrial, and Institutional Accounts

The City does not currently implement this program due to the cost and social factors. Most of the water is consumed by residential users who do not have meters and are billed at a flat rate. To implement a mandatory conservation program for only commercial, industrial, and institutional accounts would be prejudicial. In addition, the City currently does not have the staff developing or performing this DMM. To ensure the success of this program, it will most likely occupy 1.5 full-time persons per year. Including benefits and training, the cost of 1.5 persons per year will be about $100,000. The following cost and benefit analysis includes materials and personnel expenses needed for the program. Implementation of the program includes the following components: distribute the October 1994 DWR publication Water Efficiency Guide for Business Managers and Facility Engineers and conduct water audits for all commercial and industrial customers.

| | |
|---|---:|
| Total Costs | $239,000 |
| Total Benefits | $200,000 |
| Discount Rate | 4.1% |
| Time Horizon | 20 |
| Cost of Water ($/AF) | 256 |
| Average Annual Water Savings (over 20 year period, AF/yr) | 27 |

## 6.10 DMM10 – Wholesale Agency Programs

This DMM is not applicable to the City of Woodland.

## 6.11 DMM11 – Conservation Pricing

Conservation pricing is a rate structure that increases the unit cost of water as the amount of water use increases to different tiers. Effectiveness of such a program is predicated on the demand for water, the income of the customer and the number of alternatives to save water.

This program is not currently implemented in the City due to lack of meters in the City's service area. The City of Woodland charges approximately $65-85 bimonthly for unmetered residential water and sewer services. Nonresidential water use is metered and charged at a rate of $1.02 per hundred cubic feet plus meter maintenance charges that range from $1.28 for a ¾" meter to $51.07 for a 6" meter.

### 6.11.1 Economic Feasibility

The cost of this program is the cost of reading meters and billing customers on the basis of a conservation rate structure. Currently, the City is not required to meter water customers. To implement water metering, the estimated cost is $15 million dollars which includes installing new meters for connections prior to 1992, surveying and repairing meters installed since 1992, installing metering reading devices, and replacing the existing billing systems. This cost was not included in the 2000 Urban Water Management Plan. However, with the recent passage of Assembly Bill (AB) 2572, the City will be fully metered by 2025. This DMM would be economically feasible in 2025 when meters are installed. The City will continue to work on the funding and implementation of the meter program along with proper rate structures to recover costs and promote conservation. The City will also seek available funding from the Department of Water Resources and other State and federal funding agencies to implement the meter program and this DMM.

The cost benefit summary for implementation of this DMM is provided below:

| | |
|---|---:|
| Total Costs | $18,000,000 |
| Total Benefits | $13,900,000 |
| Discount Rate | 4.1% |
| Time Horizon | 20 |
| Cost of Water ($/AF) | 42 |
| Average Annual Water Savings (over 20 year period, AF/yr) | 3,427 |

## 6.12 DMM12 – Water Conservation Coordinator

### 6.12.1 Implementation Description

The City employs a full time Conservation Coordinator for outreach and education programs that focuses on solid waste recycling. The City has also hired an Environmental Analyst to manage environmental programs, including water conservation but there is no dedicated conservation coordinator for water. Approximately 5% of the Conservation Coordinator and Environmental Analyst's time is involved in water conservation. The Conservation Coordinator incorporates water conservation measures into Solid waste recycling program when possible and coordinates with the distribution of low flow shower heads and toilet rebate programs. The Environmental Analyst prepares the budget, supervises the Conservation Coordinator, and provides guidance on implementation.

### 6.12.2 Implementation Schedule

In FY 2005-2006, a Water Conservation Coordinator was requested but not approved due to funding. In FY 2006-2007, a request for water conservation coordinator will continue.

The Conservation Coordinator will continue to provide coordination and oversight of conservation programs, communicate and promote water conservation issues to the City's Public Works Director; coordinate the City's conservation programs with operations and planning staff; prepare the annual conservation budget; and provide input in the preparation of the conservation elements of the Woodland's Urban Water Management Plan.

### 6.12.3 Methods to Evaluate Effectiveness

The City evaluates the effectiveness of the Conservation Coordinator by tracking the number of water saving devices distributed. Currently, the City has no dedicated Water Conservation Coordinator so the method of evaluating effectiveness is not applicable.

### 6.12.4 Conservation Savings

The water savings resulting from the activities of a Conservation Coordinator are equal to the composite savings resulting from the implementation of Conservation programs.

### 6.12.5 Budget

There is no budget for a dedicated Water Conservation Coordinator.

## 6.13 DMM13 – Water Waste Prohibition

### 6.13.1 Implementation Description

The City established a "No-Waste" ordinance in 1991. Enforcement includes notifying "gutter flooders" of waste, as shown in Appendix D.

### 6.13.2 Implementation Schedule

This DMM is currently implemented and enforced.

### 6.13.3 Methods to Evaluate Effectiveness

The City has no method to quantify the savings of this enforcement but believes that this program is in the public's interest. DMM-13 could be evaluated by conducting a survey of customers on how they have changed outdoor water use practices as a result of the ordinance. A telephone survey of 500 residences could be conducted for about $5,000 that would include a limited set of water use questions. This survey could be repeated at regular intervals as part of a continuing evaluation of the effectiveness of the City's water conservation policy.

### 6.13.4 Conservation Savings

The water savings resulting from implementation of the water waste ordinance are not quantifiable.

### 6.13.5 Budget

Enforcement costs are a part of the water department's overhead.

## 6.14 DMM14 – Residential Ultra-low-flush Toilet Replacement Program

### 6.14.1 Implementation Description

The City established an ultra-low flush toilet replacement program following the State adoption of a ULFT mandatory program in January 1992. The City rebates $100 on the cost of each toilet for residential customers only.

### 6.14.2 Implementation Schedule

The program began in FY 2003 – 2004 and will continue in next fiscal year (2006-2007). The City provides $10,000 to fund one hundred $100 rebates. In FY 2003 – 2004, 2004 – 2005, and 2005 – 2006, the City has provided 66, 80, and 63 (to date) rebates, respectively. The program will continue in FY 2005 – 2006. There seems to be an increased interest in this program. If the public in the ULFT rebate program shows little interest, the City may shift the funding for High-efficiency Clothes Washers rebates.

### 6.14.3 Methods to Evaluate Effectiveness

The effectiveness of the program is determined by tracking the number of rebates distributed.

### 6.14.4 Conservation Savings

Conservation savings varies depending on the age and water use of the toilet being replaced. However on an average, studies have shown that about 40 gallons per household per day is saved. Therefore, approximately 4,000 gallons would be saved per day per year in which 100 rebates were distributed.

### 6.14.5 Budget

The City budgets $10,000 for ULFT rebates annually.